HAER
IOWA
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KILBOURN BRIDGE
(Des Moines River Bridge)
Iowa Recording Project
Spanning over Des Moines River
on county road
Kilbourn
Van Buren County
Iowa

HAER No. IA-85

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WRITTEN HISTORICAL & DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
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HISTORIC AMERICAN ENGINEERING RECORD

KILBOURN BRIDGE
(Des Moines River Bridge)

HAER No. IA-85

Location:	Spanning the Des Moines River on a county road at Kilbourn; Van Buren County, Iowa. UTM: 15.586410.4516250 USGS: Section 11, Township 69 North, Range 10 West
Date of Construction:	1908-09
Designers:	Iowa State Highway Commission
Builders:	Ottumwa Supply and Construction Company, Ottumwa, Iowa
Fabricators:	Toledo Massilon Bridge Co.; Cambria Steel Company, Pittsburgh, Pennsylvania
Present Owner:	Van Buren County
Present Use:	Roadway bridge
Significance:	The Kilbourn Bridge is significant as the first large-scale engineering project undertaken by the Iowa State Highway Commission and one of the only pin-connected truss designs used by the ISHC prior to adopting its standard, rigid-connected truss plans in 1913. It is a well-preserved example of wagon truss construction and one of the last of the multiple-span six pin-connected Pratt through trusses remaining in Iowa.
Historians:	Richard Vidutis, James Hippen
Project Information:	This document was prepared as part of the Iowa Historic Bridges Recording Project performed during the summer of 1996 by the Historic American Engineering Record (HAER). The project was sponsored by the Iowa Department of Transportation (IDOT). Preliminary research on this bridge was performed by Clayton B. Fraser of Fraserdesign, Loveland, Colorado.

EVENTS SCHEDULE

October 18, 1881 - John Craig granted a five year franchise by the Van Buren County Board of Supervisors for a ferry service across the Des Moines River at Kilbourn.

June 19, 1900 - board of supervisors appropriate up to $17,000 for the building of a wagon bridge at or near Kilbourn. The Western Bridge Co., Chicago, Illinois is contracted to build the bridge--four equal spans totalling 800'--for $14,950.

February 20, 1901 - board instructs supervisor William Hastings to examine Kilbourn Bridge and order work done that he deems necessary. Board orders that no further warrants be drawn by the Western Bridge Co.

March 29, 1901 - Modern Steel Structural Co., Waukesha, Wisconsin files claims against the contract between Western Bridge Co. and Van Buren County concerning materials furnished being different from contract requirements, thus causing construction delays.

November 25, 1901 - board authorizes county attorney to report on exact differences in materials used on the bridge in order to pay only for what was provided.

November 13, 1903 - board issues $30,000 in bonds to pay outstanding bridge warrants for Kilbourn Bridge.

May 31-June 1, 1903 - Kilbourn Bridge washed away by flood of 1903.

April 6, 1904 - board petitioned by citizens of Van Buren County to rebuild Kilbourn Bridge

April 5, 1905 - board once again petitioned by citizens of Van Buren County to rebuild Kilbourn Bridge.

June 6, 1905 - issue of rebuilding Kilbourn Bridge discussed at board meeting.

January 8, 1907 - board once again petitioned, this time by 800 citizens of Van Buren County to rebuild at Kilbourn Bridge. Board resolves: to consult with engineer to prepare plans for a wagon bridge; to build a bridge according to engineer's plans; and appropriates $20,000 for construction.

April 5, 1907 - board discusses idea to relocate to Kilbourn the bridge over Des Moines River at Pittsburgh; Pittsburgh would get a new combination inter-urban railroad plus highway.

April 13, 1907 - Col. G.A. Eberhart, Des Moines, consulting engineer to the board, suggests reusing spans from Pittsburgh bridge on new piers at Kilbourn; while at Pittsburgh, building a new superstructure on existing piers in order for the county to save money.

May 2, 1907 - Col. Eberhart told by board to make arrangements for letting of a contract for the erection of the Kilbourn Bridge.

May 15-16, 1907 - board meets at Kilbourn Bridge site. Board, county surveyor, and engineer decide on concrete sub-structure for Kilbourn Bridge. Col. Eberhart employed to make plans and specifications for piers and abutments. Letting date set for June 12, 1907, later changed to June 26.

June 26, 1907 - bids opened in response to three design propositions: 1) two concrete abutments, four concrete piers, four steel cylindrical pier, five steel spans (each 160' long); and 3) six steel cylindrical piers, five steel spans (each 160' long). Six companies bid. Illinois Steel Company, Jacksonville, Illinois was lowest bidder.

June 27-28, 1907 - board deliberates over bridge finances for two days.

July 2, 1907 - board decides insufficient funds are available and voids the contract.

February 3, 1908 - Thomas H. MacDonald, Iowa's State Highway Engineer, meets with the board to make changes to plans and specifications for the Kilbourn Bridge.

May 18, 1908 - board once again meets to examine plans for Kilbourn Bridge and sets letting date for June 11, 1908.

June 11, 1908 - Ottumwa Supply and Construction Co. is lowest bidder.

June 18, 1908 - board meets to enter into contract with Ottumwa Supply and Construction Co. to build a "wagon and foot bridge" for $23,400. Board requests the company to lengthen its bond (of $5,850) by six months to cover any construction delays.

June 29, 1908 - Van Buren County Board of Supervisors signs contract with Ottumwa Supply and Construction Co. to build the Kilbourn Bridge.

October 20, 1908 - board notifies U.S. Fidelity and Guarantee Co. that Ottumwa Supply and Construction Co. has defaulted by not completing work on the substructure by contract date of October 1, 1908.

February 26, 1909 - board extends completion date to July 1, 1909. Discusses payment for fabricated materials by Toledo Massilon Bridge Co. Authorizes payment of $7,861.92 to Ottumwa Supply and Construction Co.

June 10, 1909 - board inspects Kilbourn Bridge and reports that it is not likely it will be completed by July 1, 1909. Bond guarantor company informed that W.S. Elerick, low bidder on pier concrete, was in default.

December 22, 1909 - board meets at Kilbourn for final inspection of new bridge and concludes it was built to specifications, except for one pier which was found to be defective. $500 was retained from the sum owed the contractor until pier was repaired.

INTRODUCTION

The Van Buren County Board of Supervisors chose a design--presumably a truss of four equal spans totalling 800'--to be Kilbourn's first bridge crossing in 1900; previously the Des Moines River at Kilbourn was crossed via ferry service started in 1881. But just three years later, the flood of 1903 washed away the newly built Kilbourn Bridge. In the midst of petitioning the Van Buren board, another even greater flood in the Des Moines River Basin destroyed 85 bridges in Van Buren County alone. It was not until 1907 that serious concern was given to building a crossing at Kilbourn. In that year the board rushed quickly to locate the exact site of the proposed bridge, ordered Col. G.A. Eberhart to draw up plans and specifications for the bridge; and requested bids on three design propositions. The Illinois Steel Co., of Jacksonville, Illinois was the low bidder, but, nevertheless, it was more than the county could afford. Thomas H. MacDonald, Iowa's State Highway Engineer, was called in to review and make changes to the previous plans and specifications. On June 18, 1908, a contract was let to the lowest bidder, the Ottumwa Supply and Construction Co., to erect the Kilbourn Bridge for $23,400. Completion date was set for October 1, 1908, but had to be extended first to July 1, 1909, and probably to December 22, 1909, when the board met at Kilbourn to make its final inspection of the bridge.

The Kilbourn Bridge was built during the formative years of the Iowa State Highway Commission, a time during which the commission played a relatively minor role in bridge design and construction being concerned more with small-scale demonstration projects. The Kilbourn Bridge is not only historically significant as the first large-scale engineering project undertaken by the ISHC, and one of the few major bridge commissions undertaken, but it is also unique for employing the only pin-connected truss design used by the ISHC prior to adopting its standard in 1913, a rigid-connected truss plan.

Today the Kilbourn Bridge stands as a well-preserved example of one of the last of the multiple-span pinned trusses remaining in Iowa.

I. REGIONAL HISTORY

The vast area of Iowa was included in the Louisiana Purchase, approved by Congress in 1803. In 1807, Iowa was included in the Territory of Illinois; in 1812, in the Territory of Missouri; in 1834, with the Black Hawk Purchase, all of the territory west of the Mississippi and north of the northern boundary of Missouri was made a part of the Territory of Michigan. In September,

counties, in Iowa. These counties were Dubuque and Des Moines. In 1836 the Territory of Wisconsin was organized and Iowa became part of the political division. Meeting in October of 1836, the Legislature of the Territory of Wisconsin divided Des Moines County into Lee, Des Moines, Henry, Louisa, Muscatine, and Van Buren Counties. At that time the western boundaries of Van Buren were not defined but extended to the farthest boundary of the territory possessed by the United States. Farmington was designated as the county seat of Van Buren County.[1]

Van Buren County contains fourteen townships and the whole county is cut diagonally by the Des Moines River. Flowing northwest to southeast, the Des Moines basin affords a large belt of timber making the county one of the most forested in the state. The prairies are small but with soil equal to the average prairie soil of the West. The major mineral deposits in Van Buren County are coal--rich in soft bituminous coal with about two-thirds of the county underlaid with coal-seams--and limestone with quarries found in the bluffs of almost every stream. Van Buren County contains more variety in geological features than any other in the state.[2]

A few white settlers are known to have spent the winter at Lick Creek (opposite to where Kilbourn is today) in 1832-33 who then established a trading post in 1833 at the spot.[3] It was laid out in July 1839, by John Patchett. For a while the town of Kilbourn[4] was formerly called Philadelphia. "Nothing ever became of the place outside of a "paper" town--that is, a drawing of the shape and dimensions of lots on paper."[5]

Part of the great Des Moines River Valley, Kilbourn is about 40 miles from the mouth of the Des Moines on the Mississippi. In 1843 the Agatha sailed to the Raccoon River fork west of Des Moines and about 170 miles from the Mississippi. The voyage was reported in such glowing terms that by 1946, Congress adopted a bill to set aside a strip of public land five miles wide on each

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[1]The History of Van Buren County, Iowa (Chicago: Western Historical Co., 1878), pp.361-362.

[2]Ibid., pp 332-333.

[3]Ibid., p. 357.

[4]The spelling of "Kilbourne" slowly changed to "Kilbourn" as evidenced in the Minutes of the County of Van Buren Board of Supervisors. The change took place around 1905.

[5]Ibid., History of Van Buren County, p. 504.

side of the Des Moines with intentions to make room for navigation improvements on the stream from its mouth to the Raccoon River. A plan was established in 1849 and called for the construction of 28 dams and a number of locks and canals. The first three dams were built in Missouri, with the next seven in Iowa: dam number four was built near Farmington, number five at Bonaparte, number six at Bentonsport, number seven at Keosauqua, number eight near Kilbourn, number nine at Portland, and number ten one mile above Iowaville. The first seven dams with locks were completed and put into operation, and progress was made on dams eight (Kilbourn), nine, and ten, but little or no work was done on all the others. Eventually litigious challenges stopped the most ambitious river improvement project in the state of Iowa.[6]

Interest in improving the Des Moines River basin rests in the frequent experience of its inhabitants during occasional but devastating floods. The flood of 1903 destroyed the old bridge at Kilbourn and set into motion petition drives which eventually led to the construction of the steel pin-connected Pratt through truss completed in 1909. Recording the largest discharges of water into the Mississippi, Van Buren County suffered over $200,000 in damages in 1927 from the flood of 1903 with many thousands of people being driven out of their homes.[7] Again, in June 1905, record-breaking torrential rains started to fall in the lower Des Moines Valley. In nineteen hours the Mississippi had risen 8'. In Van Buren County 85 county bridges were swept away.[8]

II. HISTORY OF THE KILBOURN BRIDGE

The earliest known reference by the Van Buren County Board of Supervisors to the need of a crossing of the Des Moines River at Kilbourn occurs in its minutes of October 18, 1881. On that day John Craig appeared before the board and petitioned it for a ferry franchise at Kilbourn. The board granted him the franchise for five years and fixed the rates of toll.[9]

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[6]William J. Petersen, Iowa: The Rivers of Her Valleys (Iowa City: The State Historical Society of Iowa, 1941), pp. 192-94.

[7]Ibid., p.198.

[8]Ibid., pp. 169-70.

[9]Van Buren County Supervisor's Record, Book D: p. 243 (October 18, 1881). Located at the Van Buren Courthouse, Keosauqua, Iowa.

The history of the planning and construction of the Kilbourn bridges, the first in 1900 and second in 1908-9, are marked by delays in construction caused by unauthorized substitution of materials, even defective materials. This unfortunate state of affairs plaguing the construction of the bridges at Kilbourn took place during a time of limited budgets caused by the destruction wrought by the floods of 1903 and 1905. The problems with construction schedules and defective materials also brought about claims being filed by one company against another and by the county against the construction companies.

The first interest expressed in a bridge crossing at this location, appears on June 19, 1900, when the Van Buren County Board of Supervisors resolved to appropriate funds not to exceed $17,000 for the construction of a bridge at Kilbourn. That same year a contract was let to the Western Bridge Co., Chicago, Illinois for the building of a bridge of four equal spans totaling 800' for the bid price $14,950. Work began as soon as the company filed bonds.[10]

With trouble in the air, on February 20, 1901, one of the board's own supervisors examined the Kilbourn Bridge so that he could order work done that he deemed necessary. Concerns over the situation at the bridge construction site also led it to stop any further warrants from being drawn by the Western Bridge Co. until after the April 1901 meeting of the board.[11]

The Modern Steel Structural Co. of Waukesha, Wisconsin filed claims against Van Buren County and the Western Bridge Co. causing delays in completing the work. The board considered whether the county should sue in order to preserve whatever rights the county may have pending settlement.[12] The materials presented by Western Bridge Co. were different from those called for in the contract for construction. The board sought information as to the exact differences in the value of the materials in order to make sure it paid only for what it had received.[13] On November 13, 1903, the board adopted a resolution to issue thirty bonds at $1,000 to cover the costs of the

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[10]Ibid., Book E: pp. 626-27 (June 19, 1900).

[11]Ibid., Book F: p. 24 (February 20, 1901)

[12]Ibid., p. 25 (March 29, 1901).

[13]Ibid., p. 57 (November 25, 1901)

outstanding Bridge Warrants issued in payment of the Kilbourn and other bridges.[14]

The board minutes do not record when the first bridge was completed, but it must have been shortly after the Kilbourn Bridge was washed away by the flood in 1903. About nine months later citizens of Van Buren County began to present a series of petitions to the board. The first was presented on April 6, 1904, but no immediate action was taken. The second petition came one year later on April 5, 1905, followed by a hearing two months later on June 6, 1905,[15] but again no action was taken. January 8, 1907, exactly one and a half years later, the board finally resolved the matter of the Kilbourn Bridge. Although unstated in the board minutes, it is almost certain that this lengthy delay was caused by the great destruction of bridges brought by the floods of 1903 (when the first Kilbourn Bridge was washed away and probably others too) and 1905 (when 85 bridges were washed away in Van Buren County alone). This would have meant that many other communities were clamoring for replacement of their crossings making the county strapped for funds and incapable of replacing all the bridges at once. With so many bridges destroyed, crossings would have been far and few between. Thus the immediate outcry for a crossing at Kilbourn was demonstrated on the January 8, 1907 meeting of the board when 800 citizens of Van Buren County presented a petition, requesting the replacement of the Kilbourn Bridge.[16]

Under pressure, the board resolved to consult with an engineer to prepare necessary plans and specifications for a "good and sufficient wagon bridge," to construct the bridge according to the engineer's plans, and appropriated a sum of $20,000 for its construction.[17] On April 5, 1907, the board considered a suggestion to remove the bridge over the Des Moines River at Pittsburgh and reerect it at Kilbourn; the new proposed Pittsburgh crossing would be a combination inter-urban railroad plus highway. During a meeting on April 13, 1907, the board called in Col G.A. Eberhart, civil engineer from Des Moines and consultant to the board. According to his estimates, the county could save money by reusing the spans from the Pittsburgh bridge

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[14]Ibid., p. 124 (November 13, 1903); p. 126 (November 20, 1903).

[15]Ibid., p. 135 (April 6, 1904); p. 154 (April 5, 1905) p. 158 (June 6, 1905).

[16]Ibid., p. 217 (January 8, 1907).

[17]Ibid.

on new piers at Kilbourn; while at Pittsburgh, a new superstructure would be placed upon the existing foundation. Commitment to the two part plan was dependent on whether a proposed inter-urban railroad company was able to submit a proposition for the erection of the Pittsburgh superstructure, and its future maintenance, at no cost to the county. Such a proposal would then warrant the board in delaying the final consideration of the Kilbourn Bridge matter as requested by the inter-urban company until May 1, 1907. But with no proposals being offered for the Pittsburgh-Kilbourn bridge scheme by May 1, the Auditor of Van Buren County instructed Col. Eberhart to meet with the board to set up a date for the letting of the Kilbourn Bridge.[18] The meeting of the board with Col. Eberhart, which took place on May 15, 1907, decided to meet the next day at the bridge site with David Williams, the county surveyor, in order to set the exact site of the new bridge, and to determine other specifics such as the height of the piers and abutments, fills, landings, and the like. After a careful inspection of the site, it was decided the best location for the bridge was on the section line between Sections 11 and 12, and 1 and 2, Township 69, Range 10 west. The board and engineer also discussed the piers and decided to erect a concrete substructure. The board employed Col. Eberhart to make plans and specifications for the piers and abutments based on the information received from the county surveyor. Finally the date for the letting of a contract for the substructure was set for June 12, 1907,[19] later changed to June 26.

On June 26, 1907, bids were opened in response to requests for three design propositions: 1) to build two concrete abutments, four concrete piers, with a five-span steel bridge each being 160′ long; 2)to build two concrete abutments four steel cylindrical piers, with a five-span steel bridge each being 160′ long; and 3) to build six steel cylindrical piers, with a five-span bridge each being 160′ long.[20] Six companies bid with the following results:

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[18]Ibid., p. 234 (April 5, 1907); p. 235 (May 2, 1907).

[19]Ibid., p. 236 (May 15, 16, 1907).

[20]Ibid., p. 244 (June 26, 1907).

Company	1st Prop.	2nd Prop.	3rd Prop.
Clinton Bridge Co.	$36,100	$34,400	$26,900
Illinois Steel Br. Co.	$15,500	$27,000	$22,900
Campbell-Flager Br. Co.	-------	-------	-------
Ottumwa Bridge Co.	$35,000	$33,000	$28,425
A.Y. Bane Bridge Co.	$36,300	$34,900	$28,350
Midland Bridge Co.	$33,900	$27,960	$24,100

Illinois Steel Company of Jacksonville, Illinois was the lowest bidder, although which proposition was chosen is not mentioned in the minutes. The board postponed the awarding of the contract in order to give further consideration to the bridges finances. Two days later a thorough investigation, as to the costs of the proposed bridge, over and above the bid by Illinois Steel Bridge Co., found that it would be impossible to keep within the appropriation of $20,000 allowed unless an adequate sum of money could be found to cover the extra costs. It was decided that a petition be circulated until July 2, to ascertain whether or not extra funds could be raised by that time. If not, then no contract would be issued. On July 2, 1907, a petition was presented to the board but after an examination the board decided the petition did not provide sufficient funds to keep within the appropriation set for the bridge. Therefore, the contract would not be awarded and the bid with certified check was returned to Mr. McMurphy, Vice President of Illinois Steel Bridge Co. who was present.[21]

Discussion of the Kilbourn Bridge does not occur again until February 3, 1908, when the board met with Iowa State Highway Engineer, Thomas H. MacDonald, to make changes to the plans and specifications for the proposed Kilbourn Bridge. This was in view of letting a contract for the bridge, but no date was set.[22] On May 18, 1908, the board once more examined the plans and specifications of the Kilbourn Bridge prepared by MacDonald. At this meeting the board adopted the plans and set the date of June 11, 1908, for its letting. All bids were to be accompanied by a certified check for $1,000.[23] Though no entry was found in the minutes for June 11, 1908, on June 18, 1908, the board met to enter into contract with the Ottumwa Supply & Construction Co. (presumably the low bidder) for the building of the Kilbourn

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[21]Ibid., p. 244 (June 27, 1907); p. 245 (June 28, 1907); p. 245 (July 2, 1907).

[22]Ibid., p. 255 (February 3, 1908).

[23]Ibid., p. 268 (May 18, 1908).

Bridge ("a county wagon and foot bridge"[24]) for the sum of $23,400.[25] But upon examination of the company's bond (in the amount of $5,850[26] issued by the United States Fidelity and Guaranty Co. Baltimore, Maryland), it was decided that the date of the bond should be extended by six months in case the company would not able to finish the work on the Kilbourn Bridge in the time specified in the contract. After the time extension on the bond was secured, the board signed the contract with the Ottumwa Supply and Construction Co. for the building of the Kilbourn Bridge on June 29, 1908.[27]

Problems appeared when on October 20, 1908, the board instructed the county auditor to notify the U.S. Fidelity & Guaranty Co. that Ottumwa Supply & Construction Co. had defaulted by failing to properly prosecute the work on the substructure and complete it by October 1, 1908, as agreed to in the contract.[28] A new completion date was set for February 26, 1909, but on that date the board met once again to extend the completion date to July 1, 1909.[29] They also discussed payment for fabricated materials and services, which were set according to a formula: 60 percent of the fabricated materials would be paid to Toledo Massilon Bridge Co. upon receipt of invoices, checked by the county inspector, and filed with the county auditor--the value of each invoice being based on a unit of price obtained by dividing the superstructure contract price by the total pounds of the superstructure; 30 percent to be paid after erection is completed, and 10 percent to be paid when structure is painted and accepted by the board. According to that formula, the board authorized payment of $7,861.92 from its bridge fund to Ottumwa Supply and Construction Co.[30]

On June 10, 1909, the board inspected the Kilbourn Bridge site and reported that the Kilbourn Bridge was not likely to be finished by July 1, 1909, as stipulated by the revised contract, with there being questions concerning the piers. The county

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[24]Ibid., pp. 399-400 (February 26, 1909).

[25]Ibid.

[26]Ibid.

[27]Ibid., p. 270 (June 18, 1908); p. 277 (June 29, 1908).

[28]Ibid., p. 282 (October 20, 1908).

[29]Ibid., pp. 399-400 (February 26, 1909)

[30]Ibid.

auditor then was authorized by the board to inform the United States Fidelity and Guarantor Co. of the W.S. Elerick company's default of the bond, it being the low bidder on concrete for the piers.[31]

Finally, on December 22, 1909, the board met at the Kilbourn site to inspect the bridge and concluded that it complied to the specifications in every respect, except that one pier which was found to be defective. The board retained $500 of the sum owed the contractor until such time as the pier would be repaired.[32]

III. DESIGN AND TECHNOLOGY OF THE KILBOURN BRIDGE

The Kilbourn Bridge is a six-span Pratt truss crossing of the Des Moines River, one of the major tributaries of the Mississippi. Each span is 135' in length. The height is estimated at 27'-6", and the roadway is 16'. The piers are concrete with angle iron ice cutters on the upstream side.

Although the structure is a large one, there is nothing at first glance which might distinguish it from hundreds of other Pratt truss bridges which were built in Iowa in the late nineteenth and early twentieth centuries. However, the Kilbourn Bridge is key to understanding the evolution of bridge design and its influence by the Iowa Highway Commission.

The builder's plate, after noting the date (1908), the contractors, and the county supervisors, proclaims

DESIGNED BY
IOWA HIGHWAY COMMISSION
T.H. MACDONALD, J.E. KIRKHAM
ENGINEERS
FRED R. WHITE - RESIDENT ENGINEER

The Iowa Highway Commission had been formed in 1904 as the legislature responded to calls for improving Iowa's roads. Iowa State College (now Iowa State University) at Ames was designated as the commission. The responsibility fell on members of the engineering department. While the commission was not to receive regulatory power until reorganized in 1913, it did promulgate

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[31]Ibid., p. 318 (June 9, 10, 1909).

[32]Ibid., p. 347 (December 22, 1909).

information leading to the improvement of roads and bridges.[33] This included advising supervisors "on questions pertaining to highway improvements."[34] The circumstances (noted above) in Van Buren County led to the highway commission providing a new design for the Kilbourn crossing. All three engineers listed on the builder's plate were key players in Iowa and on a national scale. Thomas H. MacDonald, after several years as the highway commission's chief engineer, went on to become head of the U.S. Bureau of Public Roads. John Edward Kirkham was a professor to the highway commissions of both Iowa and South Dakota. Fred R. White later became chief engineer of the Iowa Highway Commission.[35]

The Kilbourn Bridge of 1908, in addition to aiding a particular county, was meant as a demonstration project. The commission reported that it had prepared "special and detailed plans for structures ranging from small concrete culverts to the Des Moines river bridge at Kilbourn, Van Buren county...the largest bridge for which we have prepared plans."[36] The commission felt the bridge was an example of good design and campaigned, especially after 1913, against the poor designs sold by many private builders. The goal of the commission was to provide "not rehashed and out-of-date information, but facts based on present and prospective practice in this state."[37]

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[33]William H. Thompson, Transportation in Iowa: A Historical Summary (Ames, Iowa: Iowa Department of Transportation, 1989); George S. May, "The Good Roads Movement in Iowa," The Palimpsest 46(February 1965): 65-128.

[34]Iowa Official Register for...1911-1912 (Des Moines: 1911), p. 225.

[35]Biographical details of these engineers are beyond the scope of this report. The works of Thompson and May, cited above, provide some details of their careers in Iowa, as do the various issues of the Iowa Official Register and the Annual Reports of the highway commission. MacDonald and Kirkham were frequent contributors to the engineering press. Kirkham published Structural Engineering (McGraw-Hill) in 1914; his work in South Dakota is noted in Fredric L. Quivik, Imposing an Industrial Order on the Northern Plains, paper presented at Center for Great Plains Studies, Lincoln, NE, April 1993.

[36]Third Annual Report of the Iowa State Highway Commission...for...1907 and 1908 (Des Moines: 1909), pp. 8-9.

[37]Ibid., p. 8.

In order to discuss which design elements were considered beneficial, a comparison has been made between Kilbourn and a private design, and between Kilbourn and the highway commission design of 1915. The private design, a Pratt truss built in 1905 by the Iowa Bridge Company of Des Moines, is one of scores built by that company in the state. It represents a form of light construction that was considered unsuitable by the commission engineers.[38] The later design is a riveted Pratt truss, following Iowa Highway Commission standard design T3 of 1915.[39]

Iowa Bridge Co. 1905	Kilbourn 1908	IHC T3 1915
LOWER CHORD		
Loop bars, all panels	Eye bars, all panels except	Angles & tie plates, all panels
UPPER CHORD		
Plate & channels	Plate & channels	Plate & channels
Lacing single	Lacing single	Lacing single, closer
CONNECTIONS		
Pinned joints	Pinned joints	Riveted joints with guseet plates
RIVET SPACING IN FABRICATION		
Wide	Wide	Closer than others
PORTAL BRACING		
Angles, shallow	Angles, deep	Angles, deep
FLOOR BEAMS		
Below pin	Below pin	Above joint
WEB		
Verticals: channels & single lacing	Channels & double lacing	Channels & single lacing
Diagonals: bars or rods	bars or rods	Angles & tie plates

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[38]The specific control structure is the Pine Creek Bridge in Sec. 17/20, T88N, R8W, Buchanan County, Iowa, BUCH20 in Iowa Historic Bridge Inventory by Fraserdesign. Span 80'; built 1905.

[39]The specific control structure is the Plum Creek Bridge in Sec. 36, T89N, R4W, Delaware County, Iowa, DELA16 in Iowa Historic Bridge Inventory by Fraserdesign. Span 100'. The Plum Creek Bridge was built in 1925, but based on the 1915 Series T-Standard No. 3, in Iowa State Highway Commission Bridge

UPPER LATERAL SYSTEM		
Struts: on top of chord	Centered on chord pin	Centered on chord joint
Ties: rods	Angles	Angles
STRINGERS		
Wood	I-Beams	I-Beams
COLLISION STRUTS		
No	No	No

In many ways the Kilbourn Bridge was an advance over the light construction represented by the Iowa Bridge Co. product. Pointing the way to the future, for example, was the partial substitution of angles or other rolled shapes for rods or eye-bars as tension members. Sometimes, as in the upper laterals, this was done for general stiffness. However, in the two lower chord end panels at each end of the Kilbourn Bridge, the built-up sections were designed to take possible compressive forces due to live loads, something the Iowa Bridge design did not take into account. By 1915 the highway commission had eliminated eye-bars and rod altogether from their T3 design. The engineers who executed the new standard were MacDonald and Kirkham, the same ones who designed the Kilbourn Bridge.

In addition to a stiffer truss, Kilbourn moved toward a design that eliminated joints of three members whose axes did not meet in a single point. The upper lateral struts, for example, were eccentric to the joint in the Iowa Bridge design, but were centered on the pin in Kilbourn. The T3 truss was likewise centered in nearly every joint.

Kilbourn, however, did not solve all the problems inherent in the design of a light highway bridge that was pin connected. The floor beams were still swung below the lower chord pins, although on hangers designed to eliminate eccentricity. And, for reason unknown, the rivet spacing in the fabrication of the upper chords and end posts was still relatively wide, thus allowing rust build-up over the years to separate the plates and produce the "pie crust" or "scalloped" effect so common in old bridges.

Ironically some of the improvements found in T3 design were to prove liabilities. The deep portal bracing, which added strength to the design, was not a problem in the Kilbourn Bridge since the longer span allowed greater height for clearance. However, when the span got down to 100', as in the T3, the sides of the portal bracing became clearance hazards with the introduction of motor trucks with their high loads. Again, the collision strut, a brace from the end post to the first panel joint, was considered

a safety factor. However, it was found to introduce additional stresses and is no longer used.[40]

The Kilbourn Bridge thus represents a clear example of the rapid changes in design that were underway in the early years of the century, and the lead that was taken by the Iowa Highway Commission in promoting improvements. Not all privately designed bridges were as lightly put together as the Iowa Bridge Company example. But many were, and without the knowledge of many county supervisors. Engineers, MacDonald and Kirkham did their best to introduce the advantages of well planned innovation. The Kilbourn Bridge was their first large-scale attempt.

A final note is due concerning the contractors who built the Kilbourn Bridge. They were E.D. Fair, George A. Zika, J.F. Colson, operating as the Ottumwa Supply & Construction Company.[41] The company specialized in bridge contracting, and was heavily involved in the local market. In 1993 there were still 15 bridges in Wapello County (Ottumwa is the chief city) built by the company between 1908 and 1919. These were pony truss and beam bridges. One of the pony trusses, of riveted construction, was built in 1908, and is identified as the "earliest example in the state of this mainstay structural type."[42] Perhaps it was the result of another cooperative effort between Ottumwa Supply & Construction and the highway commission, leading to the standardized designs of riveted pony trusses in 1914. More research on this local company is desirable, but it is safe to conclude that they were important beyond their size in Iowa bridge development.

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[40]Linton E. Grinter, Theory of Modern Steel Structures, rev. ed. (New York: Macmillan, 1949), vol. 1 Statically Determinate Structures, 140.

[41]Builder's plate on Kilbourn Bridge; Mccoy's Ottumwa City Directory, 1908-1909 (Rockford, Illinois: McCoy Directory Co., 1908), pp. 219, 314.

[42]Fraserdesign, Iowa Historic Bridge Inventory (1993) WAPE03

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APPENDIX A List of Illustrations

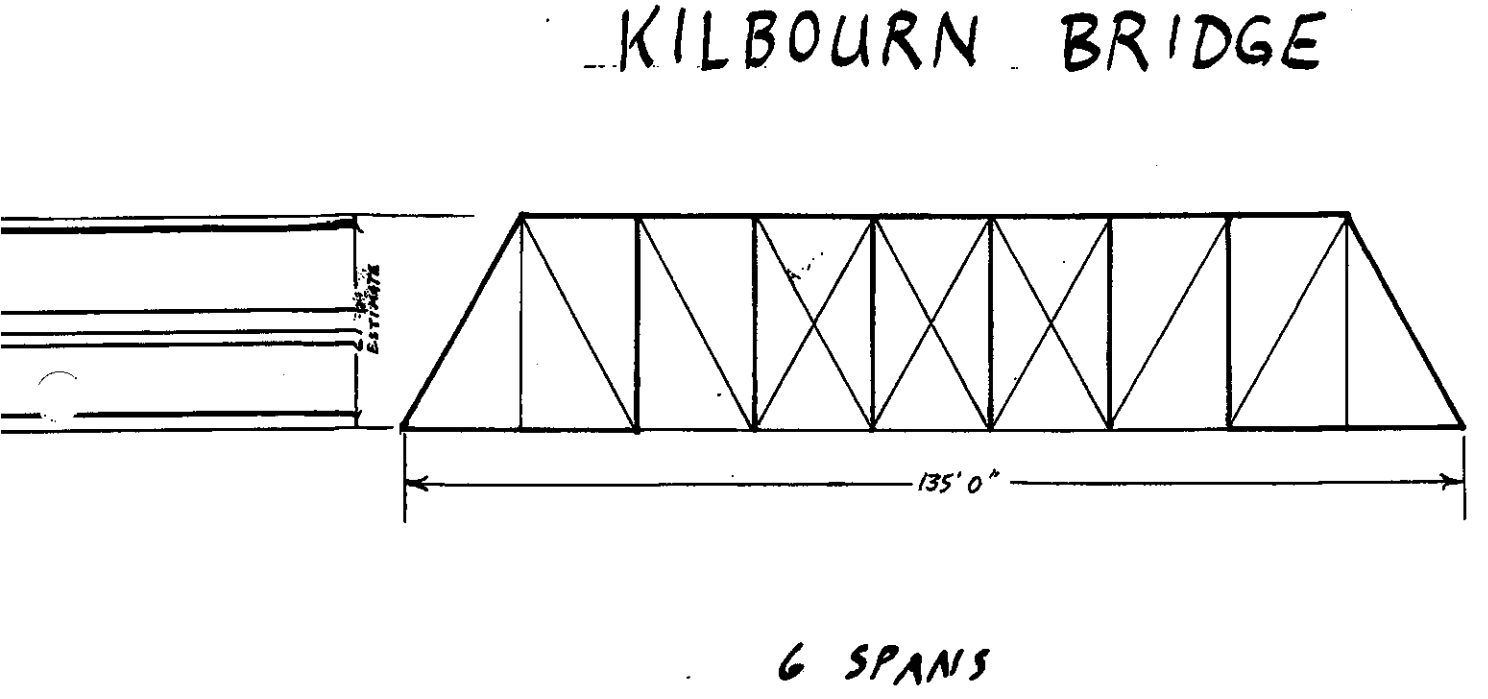

Fig. 1 Profile sketch of the Kilbourn Bridge. Jim Hippen, 1996.

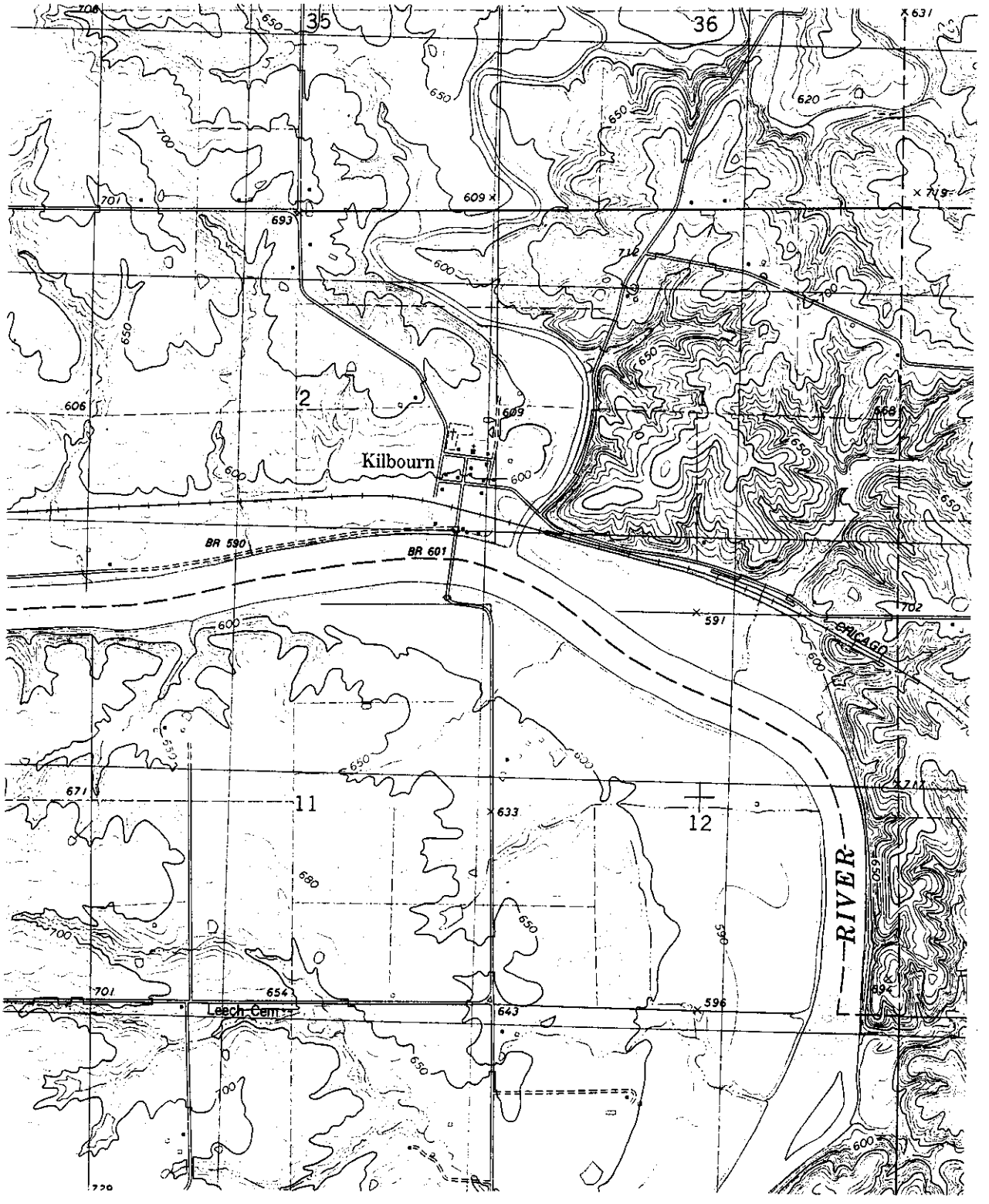

Fig. 2 USGS topo. map. Mount Zion Quad., 1981. 7.5 min. series

APPENDIX B Research Statement

Research Limitations

Unfortunately no plans of the Kilbourn Bridge were found at the Iowa Department of Transportation in Ames. The only information available about the construction of the Kilbourn Bridge is limited to the Van Buren County Board of Supervisors' Minutes found at the County Courthouse in Keosauqua. No historical photographs were found.

Future Directions for Researching the Bridge

A possible source of information on the Kilbourn Bridge may be a local historian, Mr. Ralph Arnold, who writes historical articles for the local paper in Keosauqua.

ADDENDUM TO
KILBOURN BRIDGE
(Des Moines River Bridge)
Iowa Historic Bridges Recording Project II
Spanning Des Moines River at County Road
Kilbourn
Van Buren County
Iowa

HAER No. IA-85

HAER
IOWA
89-KILB,
1-

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
1849 C Street, NW
Washington, DC 20240

HISTORIC AMERICAN ENGINEERING RECORD HAER IOWA 89-KILB, 1-

KILBOURN BRIDGE
(Des Moines River Bridge)

This appendix is an addendum to a 23-page report previously transmitted to the Library of Congress.

APPENDIX: ADDITIONAL REFERENCES

Interested readers may consult the Historical Overview of Iowa Bridges, HAER No. IA-88: "This historical overview of bridges in Iowa was prepared as part of Iowa Historic Bridges Recording Project - I and II, conducted during the summers of 1995 and 1996 by the Historic American Engineering Record (HAER). The purpose of the overview was to provide a unified historical context for the bridges involved in the recording projects."